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THE NUMERICAL APERTURE OF AN OBJECTIVE IN RELATION TO ITS ANGLE OF APERTURE IN AIR, WATER AND BALSAM.

By H. J. DETMERS, M. V. D., F. R. M. S., Columbus, O.

NUMER. APERT. n sin. u	AIR ANGLE. n = 1. °	WATER ANGLE. n = 1.33. °	BALSAM ANGLE. n = 1.52. °
.008 7265	1	0. 45	0. 39
.017 45241	2	1. 30	1. 19
.034 89516	4	3. 00	2. 38
.052 3359	6	4. 31	3. 57
.069 7566	8	6. 1	5. 16
.087 1578	10	7. 31	6. 34
.104 5286	12	9. 1	7. 53
.121 8612	14	10. 31	9. 12
.139 1730	16	12. 1	10. 30
.156 4342	18	13. 31	11. 49
.173 6480	20	15. 00	13. 7
.190 8092	22	16. 30	14. 25
.207 9120	24	18. 00	15. 43
.224 9513	26	19. 29	17. 1
.241 9217	28	20. 58	18. 19
.258 8190	30	22. 27	19. 36
.275 6373	32	23. 55	20. 53
.292 3712	34	25. 23	22. 10
.309 0171	36	26. 52	23. 27
.325 5684	38	28. 20	24. 44
.342 0206	40	29. 48	26. 00
.358 3678	42	31. 16	27. 16
.374 6060	44	32. 43	28. 32
.390 7315	46	34. 10	29. 47
.406 7364	48	35. 37	31. 3
.422 6184	50	37. 3	32. 17
.438 3707	52	38. 29	33. 32
.453 9906	54	39. 55	34. 46
.469 4710	56	41. 20	35. 59

NUMER. APERT. n sin. u	AIR ANGLE. n = I. °	WATER ANGLE. n = I.33. °	BALSAM ANGLE. n = I.52. °
.484 8089	58	42. 45	37. 12
.500 0000	60	44. 10	38. 25
.515 0381	62	45. 34	39. 37
.529 9190	64	46. 58	40. 49
.544 6387	66	48. 21	42. 00
.559 1936	68	49. 44	43. 10
.573 5763	70	51. 6	44. 20
.587 7851	72	52. 27	45. 30
.601 8153	74	53. 48	46. 39
.615 6620	76	55. 9	47. 47
.629 3203	78	56. 29	48. 55
.642 7868	80	57. 48	50. 2
.656 0591	82	59. 7	51. 8
.669 1308	84	60. 25	52. 14
.681 9984	86	61. 42	53. 19
.694 6746	88	62. 58	54. 23
.707 1066	90	64. 14	55. 27
.719 3400	92	65. 29	56. 29
.731 3525	94	66. 43	57. 31
.743 1448	96	67. 56	58. 32
.754 7103	98	69. 9	59. 32
.766 0439	100	70. 20	60. 32
.777 1464	102	71. 31	61. 30
.788 1090	104	72. 41	62. 28
.798 6370	106	73. 49	63. 24
.809 0167	108	74. 56	64. 19
.819 1528	110	76. 2	65. 13
.829 0365	112	77. 7	66. 6
.838 6692	114	78. 11	66. 58
.848 0471	116	79. 14	67. 49
.857 1686	118	80. 15	68. 39
.866 0260	120	81. 15	69. 28
.874 6200	122	82. 14	70. 15
.882 9469	124	83. 11	71. 1
.891 0061	126	84. 8	71. 46
.898 7938	128	85. 2	72. 30
.906 3083	130	85. 55	73. 12
.913 5438	132	86. 46	73. 53
.920 5043	134	87. 35	74. 33
.927 1851	136	88. 24	75. 11
.933 5808	138	89. 10	75. 47
.939 6935	140	89. 54	76. 22
.945 5174	142	90. 37	76. 56

NUMER. APERT. n sin. u	AIR ANGLE. n = 1. °	WATER ANGLE. n = 1.33. ° ' "	BALSAM ANGLE. n = 1.52. ° ' "
.951 0565	144	91. 18	77. 28
.956 3044	146	91. 57	77. 58
.961 2622	148	92. 34	78. 27
.965 9267	150	93. 9	78. 55
.970 2956	152	93. 42	79. 20
.974 3711	154	94. 13	79. 44
.978 1455	156	94. 41	80. 7
.981 6273	158	95. 8	80. 27
.984 8068	160	95. 32	80. 46
.987 6886	162	95. 55	81. 3
.990 2682	164	96. 15	81. 19
.992 5455	166	96. 32	81. 32
.994 5205	168	96. 48	81. 44
.996 1932	170	97. 1	81. 54
.997 5659	172	97. 11	82. 2
.998 6286	174	97. 20	82. 8
.999 3909	176	97. 26	82. 13
.999 8465	178	97. 29	82. 16
1.000 0000	180	97. 30 12"	82. 17

**THE NUMERICAL APERTURE OF AN OBJECTIVE IN RELATION TO ITS ANGLE
OF APERTURE IN BALSAM AND IN WATER.**

NUMER. APERT. n sin. u	BALS. A. n = 1.52. °	WATER A. n = 1.33.	NUMER. APERT. n sin. u	BALS. A. n = 1.52. °	WATER A. n = 1.33. ° ' "
.013 264 28	1	1. 9	.341 925 976	26	29. 48
.026 527 66	2	2. 17	.367 720 984	28	32. 6
.053 040 64	4	4. 34	.393 404 880	30	34. 25
.079 550 568	6	6. 51	.418 968 696	32	36. 43
.106 030 032	8	9. 9	.444 404 224	34	39. 2
.132 479 856	10	11. 26	.469 705 992	36	41. 22
.158 883 472	12	13. 43	.494 863 968	38	43. 41
.185 229 024	14	16. 1	.519 871 312	40	46. 1
.211 542 960	16	18. 18	.544 719 056	42	48. 21
.237 779 984	18	20. 36	.569 401 120	44	50. 42
.263 944 960	20	22. 54	.593 911 880	46	53. 3
.290 029 984	22	25. 11	.618 239 328	48	55. 24
.316 026 240	24	27. 29	.642 379 968	50	57. 46

NUMER. APERT.	BALS. A.	WATER A.	NUMER. APERT.	BALS. A.	WATER A.
n sin. u	n = 1.52.	n = 1.33.	n sin. u	n = 1.52.	n = 1.33.
	°	° /		°	° /
.666 323 464	52	60. 8	1.017 078 816	84	99. 46
.690 065 712	54	62. 31	1.036 637 568	86	102. 25
.713 595 920	56	64. 54	1.055 905 392	88	105. 6
.736 909 528	58	67. 18	1.074 802 032	90	107. 50
.760 000 000	60	69. 42	1.093 396 800	92	110. 36
.782 857 912	62	72. 7	1.111 655 800	94	113. 24
.805 476 880	64	74. 33	1.129 580 096	96	116. 16
.827 850 824	66	77. 00	1.147 159 656	98	119. 12
.849 974 272	68	79. 27	1.164 386 728	100	122. 12
.871 835 976	70	81. 55	1.181 262 528	102	125. 19
.893 433 352	72	84. 24	1.197 925 680	104	128. 28
.914 759 256	74	86. 54	1.213 928 240	106	131. 46
.935 796 240	76	89. 26	1.229 705 384	108	135. 13
.956 566 856	78	91. 59	1.245 092 256	110	138. 50
.977 035 936	80	94. 33	1.260 135 480	112	142. 42
.997 209 832	82	97. 8	1.274 777 184	114	146. 50

NUMER. APERT.	BALS. A.	WATER A.	NUMER. APERT.	BALS. A.
n sin. u	n = 1.52.	n = 1.33.	n sin. u	n = 1.52.
1.289 031 592	116	151. 29	1.474 849 212	152
1.302 896 272	118	156. 50	1.481 044 072	154
1.316 359 520	120	163. 35	1.486 781 160	156
1.329 422 400	122	176. 38	1.492.073 496	158
1.342 083 392	124		1.496 906 336	160
1.354 329 272	126		1.501 286 672	162
1.366 166 576	128		1.505 207 664	164
1.377 588 616	130		1.508 669 160	166
1.388 586 576	132		1.511 671 160	168
1.399 166 536	134		1.514 213 664	170
1.409 321 352	136		1.516 300 168	172
1.419 042 816	138		1.517 915 472	174
1.428 334 120	140		1.519 074 168	176
1.437 186 448	142		1.519 766 680	178
1.445 605 880	144		1.520 000 000	180
1.453 582 688	146			
1.461 118 544	148			
1.468 208 784	150			